

Historic, Archive Document

Do not assume content reflects current
scientific knowledge, policies, or practices.

OAKRIDGE FLOOD PROTECTION PROJECT

Lane County, Oregon

August, 1969

U. S. DEPT. OF AGRICULTURE
NATIONAL AGRICULTURAL LIBRARY

DEC 7 1971

CATALOGING - 11/11/71

Prepared for the
City of Oakridge
by the
Soil Conservation Service

UNITED STATES DEPARTMENT OF AGRICULTURE

AD-33 Bookplate
(7-68)

NATIONAL

**A
G
R
I
C
U
L
T
U
R
A
L**



LIBRARY

O A K R I D G E
F L O O D P R O T E C T I O N
P R O J E C T

CONTENTS

	<u>Page</u>
Introduction	1
Project Study Area	2
Problems and Objectives	2
Works of Improvement (Structural Measures)	4
Project Effects and Economic Feasibility	
Land Treatment	5
Structural Measures	5
Table 1 - Estimated Average Annual Damages and Benefits	7
Table 2 - Pipeline Data	7
Table 3 - Estimated Structural Measures Cost	8
Table 4 - Annual Costs	8
Table 5 - Comparison of Benefits & Costs for Flood Protection & Storm Drains.	9
Investigations and Analysis	
Engineering	10
Economics	11
Hydrology	12
EXHIBITS	Following Page 12
Project Map	Figure 1
Plan - Pipeline A	Figure 2
Profile - Pipeline A	Figure 3
Plan & Profile - Pipeline B	Figure 4

INTRODUCTION

A group of property owners in the Willamette City Grade School Area of Oakridge requested the Upper Willamette Soil & Water Conservation District to assist them in preparing a plan and cost estimate for a method of controlling flood waters. The Soil & Water Conservation District subsequently requested accelerated assistance from the Upper Willamette Resource Conservation & Development Project Sponsors. Meetings were held with the local group and the Soil & Water Conservation District to determine local interest, extent of damage, and objectives. A subsequent report was made to the local people. At about the time of the report the project area was annexed to the City of Oakridge. The City Council reviewed the project, and then requested the Soil & Water Conservation District to complete the report.

This Preliminary Investigation Report has been prepared under the authorities of PL 46 and PL 87-703 at the request of the City Council of Oakridge, Oregon.

OAKRIDGE FLOOD PROTECTION PROJECT

The Project study area is located within the city limits of Oakridge on the north bank of the Middle Fork Willamette River, Lane County, Oregon. The Project is in Sections 8, 9, 10, 15, 16, 17 and 18; Township 21 South; Range 3 East; Willamette Meridian. The study area contains approximately 1.93 square miles or 1,235 acres. (See aerial mosaic).

Steep wooded hills rising about 1,000 feet above and north of the City of Oakridge form the upper drainage area. There is a transition from the hills into a relatively flat bench about a quarter mile wide and sloping .01 foot per foot. This was the original Oakridge plot. The bench then drops about 30 feet very abruptly onto the Middle Fork Willamette River flood plain. This plain slopes to the southwest with a .02 foot per foot gradient until it reaches the Middle Fork Willamette River.

The Project area lies about 40 miles southeast of Eugene and 110 miles from the Pacific Ocean. It is characterized by a temperate maritime climate of wet winters and dry summers. The average rainfall is 45 inches with 70 percent occurring during the winter months from November through March. Only two percent of the total precipitation occurs during July and August. The mean January temperature is 40 degrees and the mean July temperature is 68 degrees. The frost-free growing season is about 165 days.

PROBLEMS AND OBJECTIVES

Flooding adjacent to present natural water courses is a significant problem that is preventing community development in the affected area. The flooding problem has brought about zoning controls that prevent future development unless adequate flood protection is provided by the City of Oakridge.

Control of flood waters has county, state, and national significance:

1. The county is benefited in that more people will tend to move into the community and reduce urban sprawl. This in turn will reduce the number of access roads required and provide more efficient public services. It will relieve urban pressure on agricultural and forest lands.

2. The state will be benefited because the Project would reduce highway maintenance and would reduce the transportation hazards to a major highway traversing the problem area. In addition, the State Sanitary Authority could more effectively enforce adequate sanitation and pollution control measures.
3. The nation will benefit because the reduction of water problems will encourage private industry to develop, thereby, building the economy of the community.

There are other factors that have a bearing upon community development. These factors are:

1. Pollution and unsanitary conditions caused by high water tables and flooding of septic tanks and septic fields;
2. Flood water problems which influence road and street location, maintenance, and construction;
3. Storm sewers which are being planned for relief from frequent flooding and high water tables.

The principal Project objective is to develop a master plan that will provide relief from flooding, pollution, and drainage. In addition, this plan will enable the community to develop efficient street, sanitary sewer and storm drainage systems. The City of Oakridge has had a sanitary collection, storm drainage and city street systems study completed by Cornell, Howland, Hayes & Merryfield, an engineering consultant firm, as a part of the master plan. The works of improvement for flood protection and storm drainage, as proposed herein, are an integral part of this master plan. While these studies have been coordinated, there is a continuing need to bring the various studies together into a comprehensive plan for the community under the direction of the Oakridge Planning Commission.

WORKS OF IMPROVEMENT

STRUCTURAL MEASURES

Works of improvement will consist of: Pipeline A, a principal storm drain outlet, and Pipeline B, a flood control and storm drain facility. These two pipelines have a designed capacity for the 100-year storm and will solve the excess water problems for the benefit area.

Pipeline A originates at an existing railroad culvert and consists of 920 feet of 30-inch pipe running south until it crosses the highway, U. S. 58. The pipeline then consists of 1,600 feet of 54-inch and 730 feet of 60-inch pipe, continuing south along Graden Road, and outlets into the Middle Fork Willamette River.

Pipeline B consists of 300 feet of 48-inch and 1,600 feet of 54-inch pipe along Jones Road. The pipeline originates at an existing 48-inch culvert under the Southern Pacific Railroad tracks, crosses U. S. 58 and then outlets into the Middle Fork Willamette River.

Both pipelines will serve as storm drain outlets and, in addition, Pipeline B will provide flood protection. The total cost of the works of improvement is estimated to be \$151,365.

P R O J E C T E F F E C T S
A N D
E C O N O M I C F E A S I B I L I T Y

LAND TREATMENT

The watershed of the Oakridge Project is primarily in urban use. Because of this, it does not play an important part in the successful operation of the proposed structural measures. Some consideration is being given to the urban aspects of land treatment in the development of the comprehensive city plan.

STRUCTURAL MEASURES

The installation of the Project measures will encourage additional interest in the development of resources as outlined in the plan of the Upper Willamette Resource Conservation & Development Project. The Project will eliminate flooding which adversely effects 22 acres of land. In addition, it will provide storm drain outlets for approximately 500 acres. With the installation of the flood protection measures, it is projected that community developments, such as streets, sanitary sewers, and storm sewers, will be carried out which will result in a general upgrading of the Project area. These improvements, in turn, will promote further capital improvements, help maintain a higher standard of living and contribute to the general welfare of the community.

The annual costs, amortized for a 50-year Project life at 4-5/8 percent interest rate, with operation, maintenance and replacement included, are estimated to be \$12,653. The total annual benefits are estimated to be \$19,320. The resulting benefit cost ratio is, therefore, 1.52 to 1. (See Table 1 for annual damages and benefits; Tables 3 and 4 for annual cost data; and Table 5 for a comparison of benefits and costs.)

Alternative structural measures were studied and are pointed out in the Investigations and Analysis section of this document, pages 10-12.

TABLE 1 - ESTIMATED AVERAGE
ANNUAL DAMAGES AND BENEFITS
(Dollars) 1/

TYPE OF BENEFIT	AVERAGE ANNUAL AMOUNT	
	Pipeline A	Pipeline B
<u>Flood:</u>		
Direct	0	1,570.00
Indirect	0	240.00
TOTAL	0	1,810.00
<u>Community:</u>		
Land Enhancement*	100.00	100.00
Payroll*	390.00	4,270.00
Storm Drain Replacement	7,700.00	4,950.00
TOTAL	8,190.00	9,320.00

* Community benefits have been reduced by \$4,770.00 and \$640.00, respectively, to account for associated costs of streets, sanitary sewers, and storm drains.

1/ Price Base: 1968

TABLE 2 - PIPELINE DATA

ITEM	UNIT	AMOUNT
<u>Pipeline A</u>		
Area Served	acres	150
Design Capacity	c.f.s.*	70
Pipe Diameter	inches	30, 54, 60
Total Length	feet	2,850
<u>Pipeline B</u>		
Area Served	acres	282
Design Capacity	c.f.s.	130
Pipe Diameter	inches	48, 54
Total Length	feet	1,800

*cubic feet per second

TABLE 3 - ESTIMATED
STRUCTURAL MEASURES COST
(Dollars) 1/

ITEM	UNIT	PIPELINE A		PIPELINE B	
		Amount Planned	Est. Cost	Amount Planned	Est. Cost
<u>Construction:</u>					
Excavation & Backfill	c.y.*	5,214	6,518	3,596	4,495
Concrete	c.y.	8	1,054	7	922
Pipe-30 in.	l.f.**	920	10,626	-	-
48 in.	l.f.	-	-	300	5,346
54 in.	l.f.	1,200	26,256	1,500	32,820
60 in.	l.f.	730	<u>20,075</u>	-	<u>-</u>
	Subtotal		64,529		43,583
<u>Installation Services</u>			9,679		6,537
<u>Land Rights</u>			<u>24,937</u>		<u>12,100</u>
TOTAL STRUCTURAL MEASURES			\$99,145		\$62,220

1/ Price Base: 1969

* cubic yards

** linear feet

TABLE 4 - ANNUAL COSTS
(Dollars) 1/

EVALUATION UNIT	CONSTRUCTION COSTS 2/	OPERATION MAINTENANCE & REPLACEMENT COSTS	TOTAL
<u>Pipeline A:</u>			
Storm Drain Outlet	\$5,119	\$2,580	\$7,699
<u>Pipeline B:</u>			
Flood Protection & Storm Drain Outlet	\$3,212	\$1,742	\$4,954

1/ Price Base: 1968 construction, normalized for operation, maintenance and replacement.

2/ 4-5/8% Interest: 50-year amortization period.

TABLE 5 - COMPARISON OF BENEFITS & COSTS
FOR FLOOD PROTECTION & STORM DRAINS
(Dollars) 1/

EVALUATION UNIT	AVERAGE ANNUAL DOLLARS		BENEFIT-COST RATIO
	Benefits	Costs	
<hr/>			
<u>Pipeline A:</u>			
Storm Drain Outlet	8,190	7,699	1.06
 <u>Pipeline B:</u>			
Flood Protection & Storm Drain Outlet	<u>11,130</u>	<u>4,950</u>	2.24
TOTAL	\$19,320	\$12,649	1.52
 1/ Price Base: 1968 Costs and Benefits			
<hr/>			

I N V E S T I G A T I O N S

A N D

A N A L Y S I S

ENGINEERING

Units used in arriving at engineering construction estimates were obtained by transit-stadia surveys and surveys of Oregon State Highway Department and the City of Oakridge for horizontal control and pipeline lengths. Vertical control was established by use of a self-leveling level. Control points were established at all restrictions such as road culverts or bridges. All works of improvement were designed to contain the one percent chance event.

The Project consists of two separate study areas which are designated Sections "A" and "B" (See Map, page 13). Section A was studied using five separate alternatives and Section B was studied with three alternatives. A comparative cost estimate was made of the alternatives. After evaluation of each system--based on 50-year Project life for installation, operation, maintenance, and replacement, and in line with the objectives of flood protection and local objectives--it was determined that 920 feet of 30-inch pipe be used from the Southern Pacific Railroad tracks to U. S. 58, and then 1,200 feet of 54-inch pipe and 730 feet of 60-inch pipe be used from U. S. 58 to the river to provide flood protection for the area served by Section A (See Profile, sheet 2 of 3). It was also determined that 300 feet of 48-inch pipeline be used to cross U. S. 58, and 1,500 feet of 54-inch pipeline from U. S. 58 to the Middle Fork Willamette River for Section B (See Profile, sheet 3 of 3). This system was chosen because it met with the local sponsors' desires for the Project and they were willing to pay any additional cost.

All computations were based on Mannings formula using an "n" of 0.035 for earth channels, of 0.021 for metal pipe, of 0.013 for concrete pipe and 0.013 for concrete chutes and drop structures. A design flow of 300 cubic feet per second (cfs) per square mile was used as the Project design runoff. Side slopes on earth channels were 2:1. Section A had a design flow of 70 cfs and Section B had a design flow of 130 cfs (See Map). The unit costs were based on bids obtained from similar projects in the area and distributor prices for materials. Unit costs were increased by 50 percent for contingencies and installation. Road crossings were based on Lane County Public Works Department and Oregon State Highway Department costs in the area. Land costs for easements and rights-of-way were based on the Lane County Assessor's appraisals, land sales in the area, and Lane County costs for road easements and rights-of-way in the area.

ECONOMICS

Benefits from this project are divided into two categories:

1. Flood damage reduction benefits,
2. Community-type benefits, such as land enhancement, benefits from payrolls involved in new home construction, and the substantial local savings resulting because the Project pipelines will also serve as storm drain outlets which are necessary for city development.

The community benefits depend not only on flood control but also on other improvements, such as streets, sewers and storm drains. These associated improvement costs were deducted from the total benefits to derive the actual Project benefits.

Flood damages were obtained through interviews with fourteen local residents. The main damages occurred from the December 1964 flood which was estimated to be a 3% event. Damage is expected to begin at a 30% event.

Approximately 22 acres have water problems sufficient to restrict development. Nearly 19.5 acres were located below Highway 58 and the remainder above. Local real estate agents determined the values for both before and after Project conditions. The difference of about \$900 per acre would result from the flood and urban improvements. A delay of 5 to 10 years, following Project completion, is used to discount these future benefits.

Added payrolls will result from the development of flood-plain lands for urban uses. An estimated 50% of the cost of a \$12,000 house is labor. Using this and the assumption that 1/3 of the labor could be gainfully employed elsewhere, the discounted payroll benefits were derived.

A local savings of about \$109,000 in construction costs for storm drains will be realized. Assuming a 50-year life, the average annual savings will be \$5,630. When operation and maintenance savings are added, the annual benefit will be \$12,650.

Cost estimates for sanitary and storm sewers were based on studies made by the private engineering firm of Cornell, Howland, Hayes & Merryfield, and street improvement and flood protection costs were based on studies made by the Soil Conservation Service. The associated costs were then apportioned on a per acre basis and subtracted from gross benefits prior to developing the benefit cost ratio. The total per acre costs, including O&M and replacement, were amortized at 4-5/8%.

A large but unevaluated community benefit will accrue to the local economy if some way can be found to finance construction of the proposed project. Oakridge has a complete development plan for the benefit areas which will require substantial funds to complete. Their

financial situation is such that they can do only a limited amount at any one time and essentially "pay as they go." This will cause a delay of many years before the area can begin to reach its potential. Oakridge would be able to complete its development much sooner if outside funds were used to cost-share on the storm drain and, thereby, release local funds to other developmental phases of the community plan.

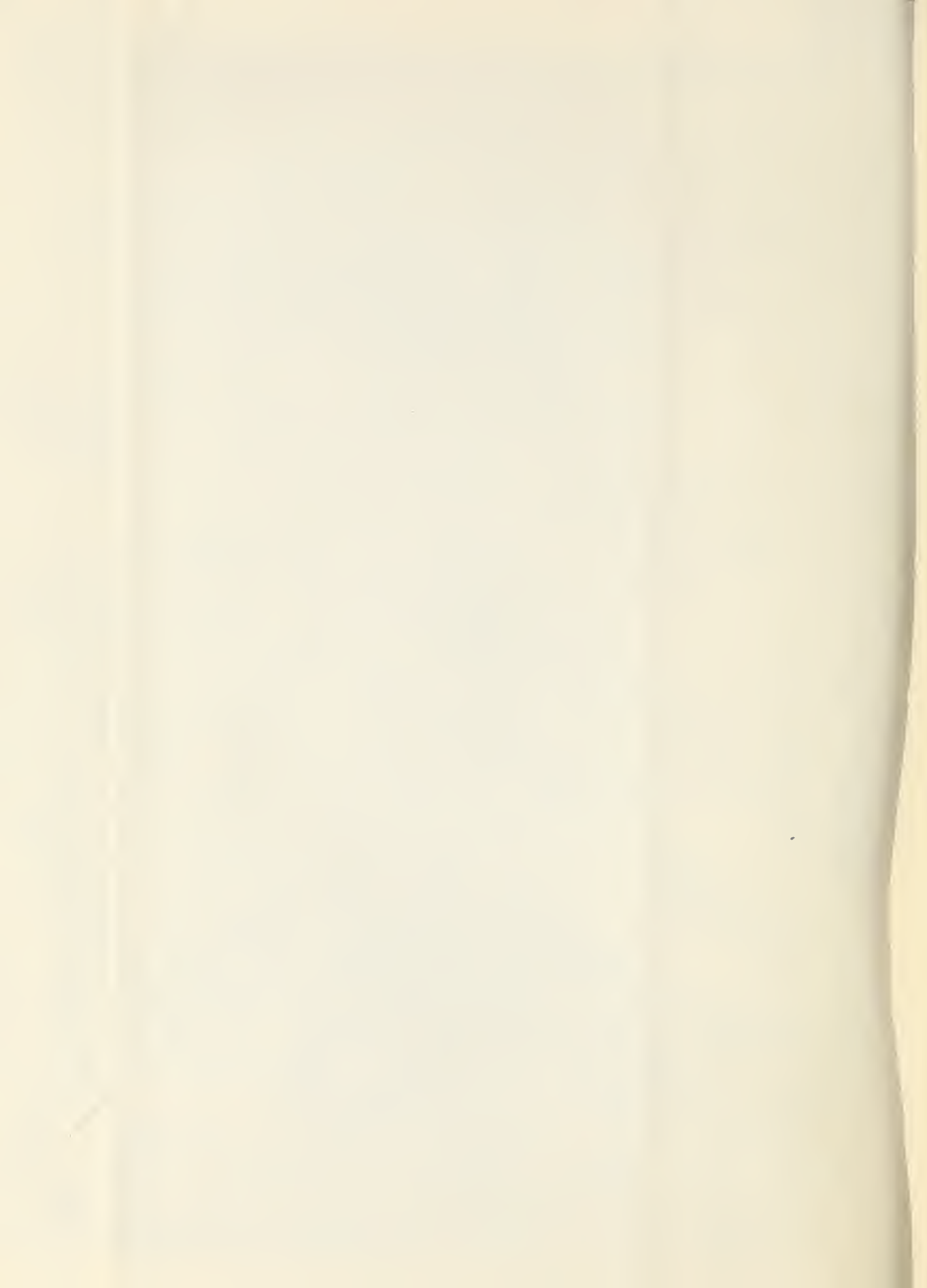
HYDROLOGY

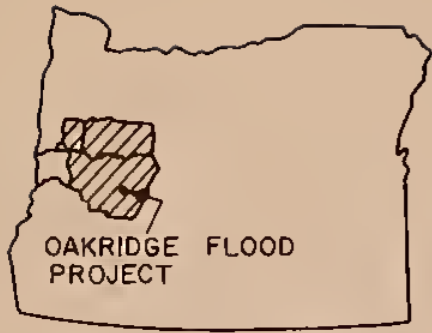
Basic hydrology was developed using the method of Soil Conservation Service, Oregon Engineering Handbook, Number 4; the National Engineering Handbook, Section 4; regional analysis method; storm rainfall; rain gauge; physical and data analysis. Correlations were made on the basis of these analyses--a design storm of 300 cubic feet per second per square mile was used.





Figure 1
OAKRIDGE
FLOOD PROTECTION
PROJECT
Lane County, Oregon
G. George SCS Engineer





LOCATION MAP

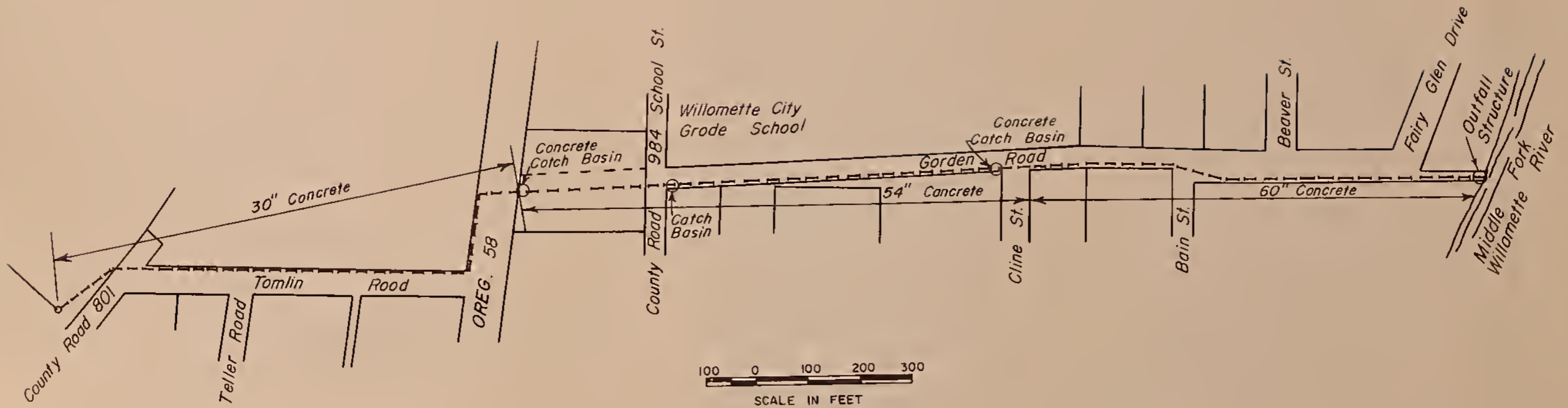
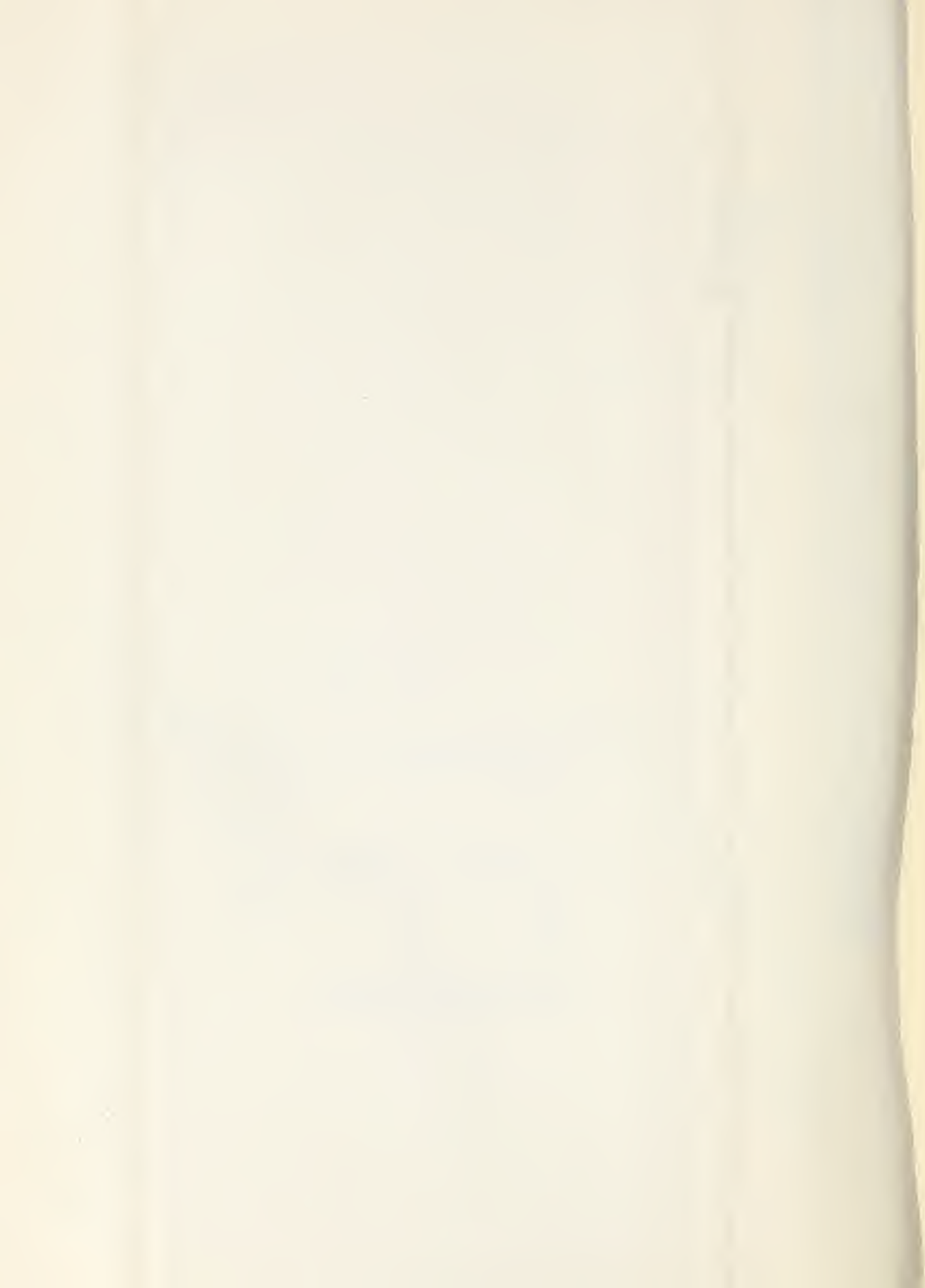
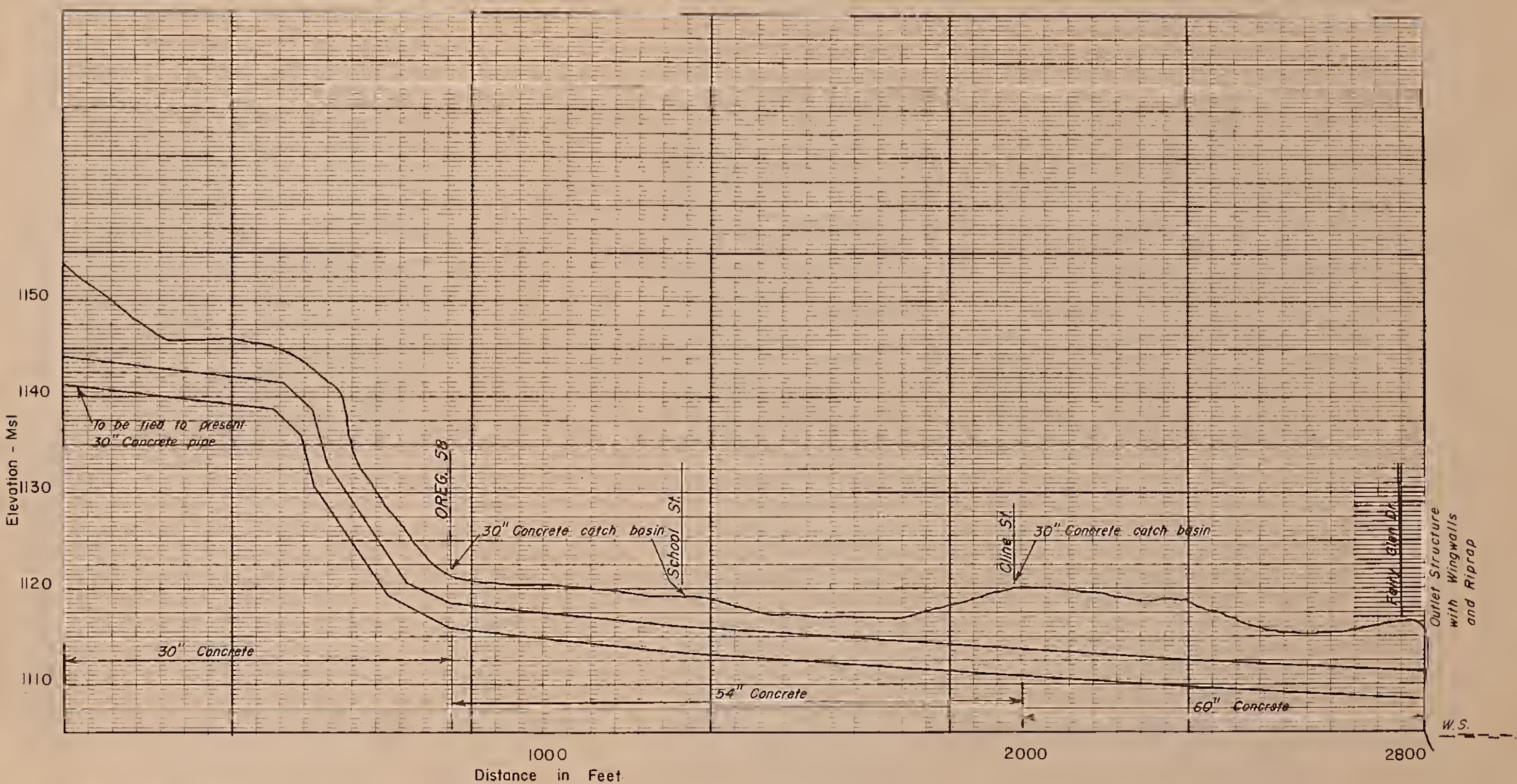


Figure 2
OAKRIDGE
FLOOD PROTECTION
PROJECT
Lane County, Oregon
Plan - Pipeline "A"
OCTOBER 1969

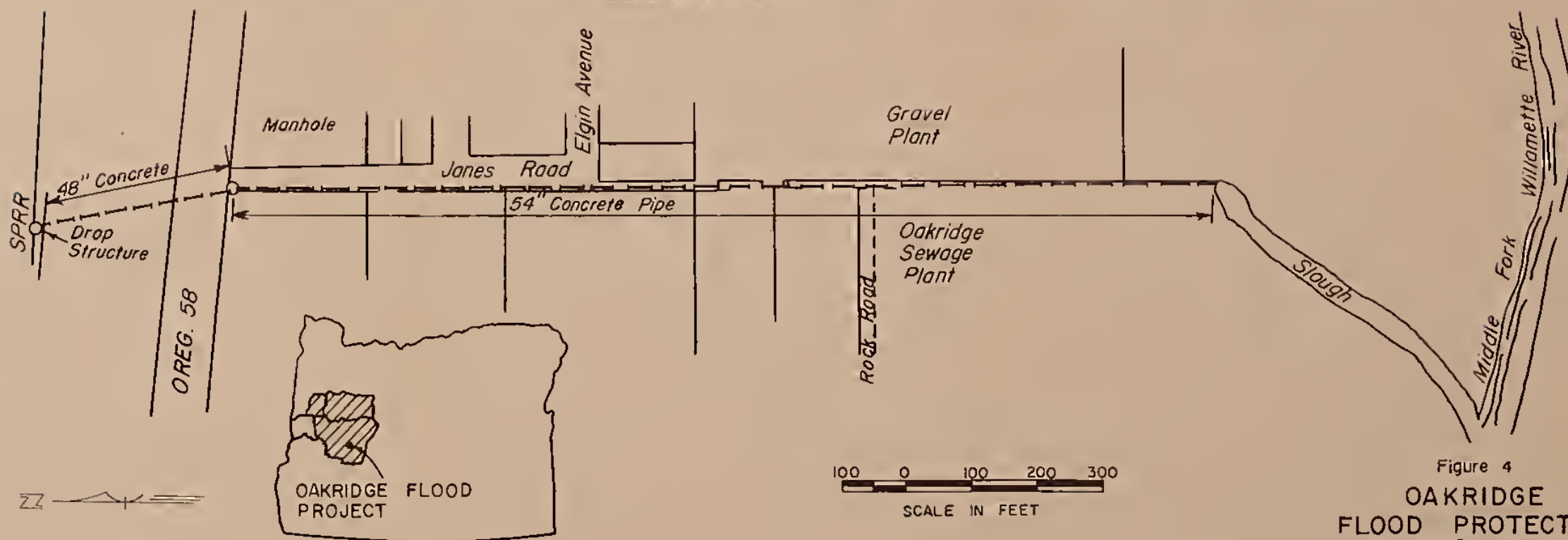
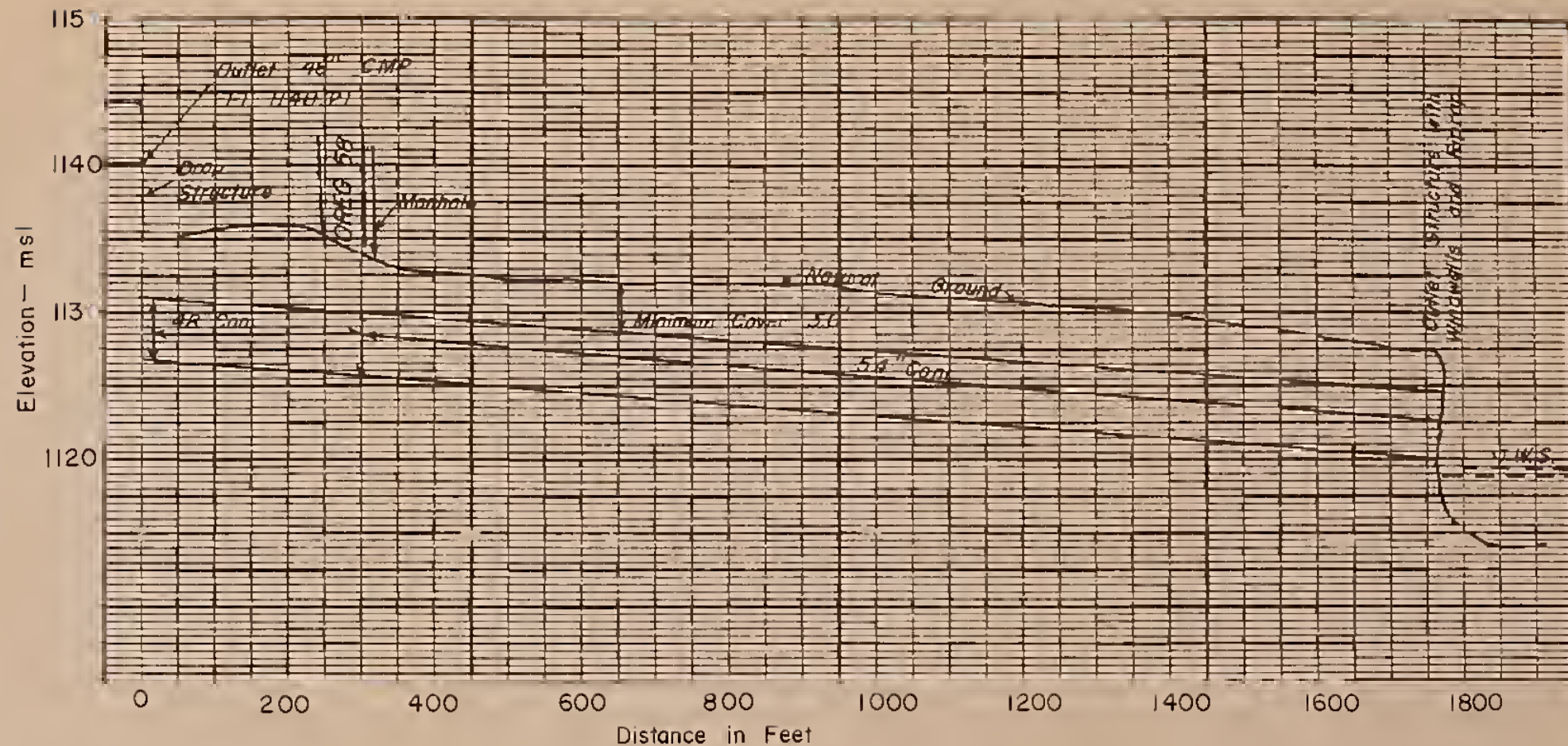




NOTE: Minimum cover of pipe 3.0'

Figure 3
**OAKRIDGE
 FLOOD PROTECTION
 PROJECT**
 Lone County, Oregon
 Profile - Pipeline "A"
 OCTOBER 1969





LOCATION MAP

Figure 4

OAKRIDGE FLOOD PROTECTION PROJECT

Lone County, Oregon

Plan & Profile - Pipeline "B"

OCTOBER 1969

